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### Program Overview

Metro Wastewater Reclamation District (Metro District) applies biosolids to their properties near Deer Trail, Colorado. These biosolids applications could affect the quality of water in alluvial and bedrock aquifers, streambed sediments, soils, and crops. Water quality can be directly affected through:

- Contaminated recharge water, or
- Infiltration of water through contaminated soils or sediments (remobilization).

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### USGS

*The U.S. Geological Survey is a science organization that provides the Nation with reliable, impartial information to describe and understand the Earth. The national USGS home page: <http://www.usgs.gov>*

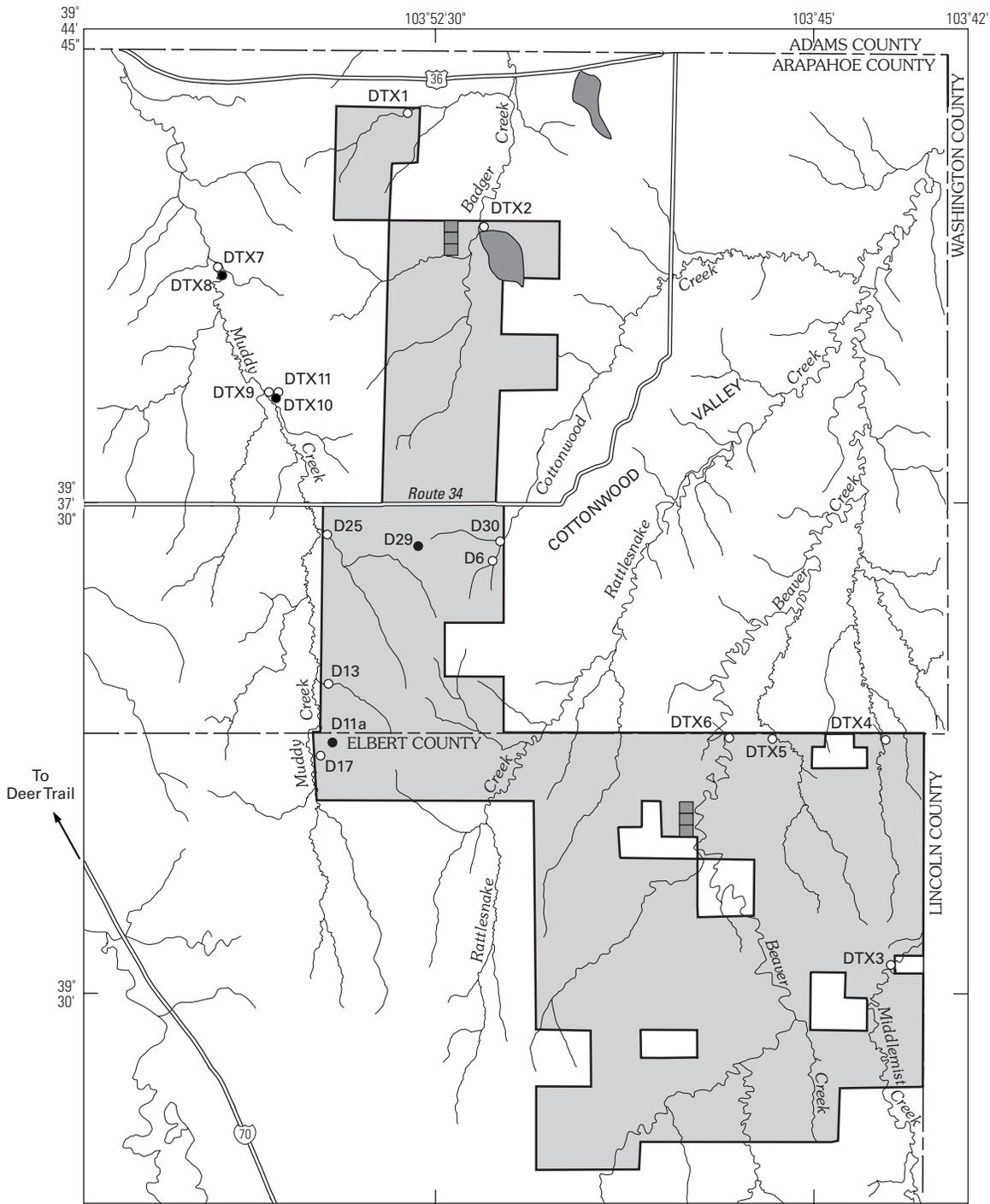
### *This USGS program:*

The Internet address for this program, including links for data and reports, is:  
<http://co.water.usgs.gov/projects/CO406/CO406.html>

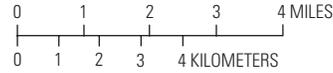
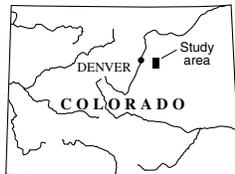
The Internet address for just the data is:  
<http://co.water.usgs.gov/projects/CO406/data.html>  
or <http://water.usgs.gov/co/hwis>



***Streams rarely flow off the Metro District property near Deer Trail. Streams only flow after rain, such as this site near USGS monitoring well DTX6 on June 12, 2003. Despite a rainy June, runoff during June was insufficient to collect streambed-sediment (runoff-deposit) samples. However, rain the night of May 30 caused enough runoff to enable streambed-sediment samples to be collected from the paired sites. See page 5 for more information.***



To Deer Trail



EXPLANATION

- Metro Wastewater Reclamation District property
- Streambed-sediment sampling area
- DTX1○ USGS alluvial monitoring well
- D29● USGS bedrock monitoring well
- Soil-sampling area

**USGS Expanded Monitoring Program sites and Metro District's biosolids-application properties (1999 property boundaries) near Deer Trail, Colorado**

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## **Program Overview**

*Continued from page 1*

Water quality can be indirectly affected through:

- Tilling that mobilizes or changes subsurface chemical constituents, or
- Contributions to natural processes such as nitrification.

Contaminated ground water or surface water could contaminate:

- Other aquifers, such as bedrock water-supply aquifers or alluvial aquifers,
- Other surface-water bodies (ponds or streams), or
- Streambed sediments.

Biosolids must meet metals and radioactivity regulations, or else agronomic loading rates will be incorrect and soils could be overloaded. Soil quality could either be improved by biosolids applications through increased nutrients and organic matter, or degraded through excessive nutrients or metals.

The U.S. Geological Survey (USGS) has designed and begun a new monitoring program to address concerns from a stakeholder group about the biosolids and the quality of the environment in the vicinity of the biosolids-application areas. The new USGS monitoring program near Deer Trail is referred to as the "USGS Expanded Monitoring Program" and began in January 1999.

This monitoring program is distinct from, but builds on, another USGS program that monitored shallow ground-water quality on the Metro District Central Farm from 1993-1998. The new program (1999-2005) considers environmental-quality issues for shallow and deep ground water, surface water (bed sediments), biosolids, soils, and crops. The new expanded monitoring program includes all three Metro District properties (North, Central, and South Farms) and related private-property locations. Both programs, however, use USGS and Metro District funds. In addition, the new monitoring program also uses funds from the North Kiowa Bijou Groundwater Management District. Both programs are designed, carried out, and interpreted independently by USGS, and quality-assured USGS data and reports will be released to the public and the Metro District at the same time. By definition and design, all USGS monitoring programs are independent and unbiased.

The objectives of the new Expanded Monitoring Program are to: (1) Evaluate the combined effects of biosolids applications, land use, and natural processes on alluvial aquifers, the bedrock aquifer, streambed sediments, soils, and crops by comparing chemical data to

- State or Federal regulatory limits,
- Data from a site where biosolids are not applied (a control site), or
- Earlier data from the same site (trends).

(2) Monitor biosolids for metals and radioactivity, and compare the concentrations with regulatory limits. (3) Determine the aquifer hydrology in this area.

The approach is unique for each component of the Expanded Monitoring Program. However, appropriate USGS methods and technologies will be applied to each component.

Progress reports such as this one were prepared quarterly for the first 2.5 years of the program and now are prepared twice each year and distributed to the stakeholders and other concerned people, as well as available to the general public on the Internet (<http://co.water.usgs.gov>). Each progress report will summarize progress from the previous quarters and plans for the current quarters; chemical data will be included twice each year. A USGS report will be prepared annually and made available after each year of the monitoring program: the reports will include data for that year, any interpretations for that year, and statistical analysis for the data to date. A comprehensive USGS report will be prepared and available after five years of monitoring that includes complete statistical analyses and interpretations. In addition, the USGS will meet with the stakeholders once a year to discuss the Expanded Monitoring Program results and to consider possible changes to the Expanded Monitoring Program.

## **Questions & Answers**

**Q:** Why can't I find recent USGS biosolids, soil, or crop data for the Expanded Monitoring Program near Deer Trail?

**A:** No USGS biosolids, soil, or crop data are ready for publication at this time. A time lag between sampling and analysis is common for these samples because these samples require drying and processing before analysis. In addition, soils and crops are only sampled every other year. Soils were last sampled September-October 2002, and crops were last sampled in July 2002. The remaining data for biosolids, soils, and crops will be published as soon as possible after it is available.

**Q:** What was the USGS doing at East Bijou Creek at Deer Trail in May?

**A:** A USGS surface-water team visited East Bijou Creek at Deer Trail 5/28/03 because the largest known flood in the U.S. for this size watershed was recorded 6/17/65 at this site. The USGS checked the site on the Bijou and reviewed site information and calculations, but so far has not found any reason to change the published streamflow value of 274,800 cubic feet per second for 6/17/65.

*Continued on page 11*

## Alluvial Ground Water

### Approach

Six monitoring wells were installed near the Metro District property boundaries in the major alluvial aquifers. These six wells plus five USGS monitoring wells from the previous project will be sampled approximately quarterly for full inorganic chemistry and annually for radioactivity January 1999 through September 2003. Data will be reviewed and statistically tested for exceedance of regulatory limits and for trends.

### Progress Last Period (January-June 2003)

Ground-water levels were measured January 2-7, February 10, March 7, April 2-8, May 2, and June 12, 2003. Ground water was sampled for chemistry in January and April 2003. Ground-water data were compiled and reviewed. The hydrogeology report for ground water 1993-99 (which includes data and interpretations for some sites included in the Expanded Monitoring Program) was submitted for final USGS approval in January 2003. The annual data report for 1999 was printed and distributed. The annual data report for 2000 was submitted for final USGS approval in May 2003. Another review of the draft annual report for 2001 was completed. USGS project reviews were completed April 21 and May 8.

### Plans for the Current Period (July-December 2003)

Ground-water levels will be measured the first week of each month through September 2003. Ground-water samples were collected July 7-15, 2003. No more ground-water samples will be collected as part of this monitor-

ing program. Data will be compiled and reviewed. Changes suggested by review comments will be incorporated into the various draft reports, and the annual data report for 2001 will be submitted for USGS approval. The draft annual report of 2002 data will be completed and presented at the September 30, 2003, stakeholder meeting. The annual report of 2003 data will be started. The final interpretive report for this monitoring program will be started.

## Bedrock Ground Water

### Approach

A structure map of the base of the bedrock aquifer was compiled and used to determine locations for two sets of new, paired wells (one alluvial well and one nearby dual-completion bedrock

well comprise each pair). The well pairs were installed where both the Muddy Creek alluvial aquifer and the Laramie-Fox Hills aquifer are present (along the margin of the bedrock aquifer) near the Metro District properties. Water-level data from each well pair will be used to determine aquifer hydrology and interaction at those two locations. The two new bedrock wells (DTX8, DTX10), along with one USGS bedrock well from the previous project (D29), will be sampled approximately quarterly for full inorganic chemistry and annually for radioactivity January 1999 through September 2003. Data will be reviewed and statistically tested for exceedance of regulatory limits and for trends.

*Continued on page 5*



***The USGS ground-water samples are bottled and preserved in a portable “clean room” (or glove box) in the back of the truck to minimize contamination of the samples from dust and dirt. The sample bottles and sampling equipment are kept in multiple layers of plastic bags also to minimize contamination of the samples from dust and dirt.***

## Bedrock Ground Water

*Continued from page 4*

### Progress Last Period (January–June 2003)

Ground-water levels were measured January 2–7, February 10, March 7, April 2–8, May 2, and June 12, 2003. Ground water was sampled for chemistry in January and April 2003. Ground-water data were compiled and reviewed. The hydrogeology report for ground water 1993–99 (which includes data and interpretations for some sites included in the Expanded Monitoring Program) was submitted for final USGS approval in January 2003. The annual data report for 1999 was printed and distributed. The annual data report for 2000 was submitted for final USGS approval in May 2003. Another review of the draft annual report for 2001 was completed. USGS project reviews were completed April 21 and May 8. A presentation about the project was made by the USGS on February 6, 2003, to the Biosolids Committee of



**The USGS checked the calibrations of the continuous-recorder instrumentation late May through early June 2003. The first site checked was DTX2 because the rain gage at this site is used to determine when streambed-sediment sampling takes place.**

the Rocky Mountain Chapter of the Water Environment Federation.

### Plans for the Current Period (July–December 2003)

Ground-water levels will be measured the first week of each month through September 2003. Ground-water samples were collected July 7–15, 2003. No more ground-water samples will be collected as part of this monitoring program. Data will be compiled and reviewed. Changes suggested by review comments will be incorporated into the various draft reports, and the annual data report for 2001 will be submitted for USGS approval. The draft annual report of 2002 data will be completed and presented at the September 30, 2003, stakeholder meeting. The annual report of 2003 data will be started. The final interpretive report for this monitoring program will be started.



**The continuous-recorder rain gage was removed from DTX5 on 5/30/03. This instrument was repaired in the Denver office then reinstalled at DTX5 on June 12.**

## Surface-Water Sediments

### Approach

Surface-water contamination is a concern for the stakeholders, but streams flow off the Metro District properties only during runoff when surface-water sampling is impractical. Therefore, possible surface-water contamination from metals will be evaluated by sampling streambed sediments soon after storms. Two small drainage basins were selected for similar characteristics but different land use—one drainage in a biosolids-application field and another drainage in a farmed field (not on the Metro District properties) that does not receive biosolids. A downstream part of each of the two drainage basins will be sampled after the same storms, three to four times per year for inorganic constituents (including metals, total nitrogen, and total phosphorous) and organic carbon, and one time per year for radioactive constituents. Samples could be collected January 1999 through September 2003.

*Continued on page 6*

## Surface-Water Sediments

*Continued from page 5*

Data will be reviewed and statistically tested to determine if concentrations are significantly different between the two drainage basins.

### Progress Last Period (January-June 2003)

The site was carefully monitored for runoff-producing rainfall. Runoff was sufficient to enable streambed-sediment sampling once in the designated basins. Paired runoff-deposit samples were collected June 1, 2003. The annual data report for 1999 was printed and distributed. The annual data report for 2000 was submitted for final USGS approval in May 2003. Another review of the draft annual report for 2001 was

completed. USGS project reviews were completed April 21 and May 8.

### Plans for the Current Period (July-December 2003)

The site will be monitored for runoff-producing rainfall. Sampling may take place, depending on the weather. Data will be compiled and reviewed. Changes suggested by review comments will be incorporated into the various draft reports, and the annual data report for 2001 will be submitted for USGS approval. The draft annual report of 2002 data will be completed and presented at the September 30, 2003, stakeholder meeting. The annual report of 2003 data will be started. The final interpretive report for this monitoring program will be started.

## Biosolids

### Approach

Biosolids samples will be taken as a 24-hour composite from the Metro District plant and analyzed by the USGS January 1999 through September 2003. Biosolids will be sampled and analyzed once each quarter during most of the program, and once each month for 6 months when the Lowry Landfill Superfund Site water transfer begins. Data will be reviewed and compared to Federal regulatory limits.

### Progress Last Period (January-June 2003)

Quarterly samples of biosolids were collected in February and April 2003. Each sample was a 24-hour composite

*Continued on page 7*



**Well DTX5 (in the enclosure on the right side of the photograph) is completed in the alluvial aquifer of a Beaver Creek tributary near the Metro District property boundary. Usually, the streambed is dry at this site. On June 12, 2003, this streambed contained considerable standing water. The streambed was nearly dry again when well DTX5 was sampled July 9, 2003.**

## Biosolids

*Continued from page 6*

from the conveyor belt at the Metro District facility. The material was placed in two acid-washed, one-gallon plastic bottles and transported to the USGS in Denver. There, the sample was air-dried then ground to less than 150 micrometers. The samples were submitted to the laboratories for chemical analyses. The annual data report for 1999 was printed and distributed. The annual data report for 2000 was submitted for final USGS approval in May 2003. Another review of the draft annual report for 2001 was completed.

### Plans for the Current Period (July-December 2003)

A quarterly biosolids sample will be collected in August 2003. The sample will be dried, ground, and submitted to the laboratories. No more biosolids samples will be collected as part of this monitoring program. Data will be compiled and reviewed. Changes suggested by review comments will be incorporated into the various draft



**Water-temperature instruments were checked during calibration of the continuous-recorder sites this spring.**

reports, and the annual data report for 2001 will be submitted for USGS approval. The draft annual report of 2002 data will be completed and presented at the September 30, 2003, stakeholder meeting. The annual report of 2003 data will be started. The final interpretive report for this monitoring program will be started.

## Soils

### Approach

One site was selected for characterizing and monitoring the chemical composition of soil on the Metro District property in Arapahoe County, and one site was selected on the Metro District property in Elbert County. Each site consists of three 20-acre (933 feet by 933 feet) fields separated by 100-foot buffer zones. The center 20-acre field at each site will have biosolids applied after the initial soil sampling. The other two 20-acre fields at each site will not have biosolids applied and will be used as “control” fields to monitor the natural variability of soil composition for the duration of the study. All three 20-acre fields at each site will be farmed in the normal fashion and have crops planted and harvested. Soils from each of the six fields will be sampled before biosolids are applied to the two center fields and then again after each harvest. Samples will be analyzed for arsenic, cadmium, copper, lead, mercury, molybdenum, nickel, selenium, zinc, plutonium, and gross alpha and beta activity. Data will be examined after 5 years to determine if concentration has changed with time.

### Progress Last Period (January-June 2003)

Soil samples collected from the Elbert County site on September 19, 2002, and from the Arapahoe County site on October 17, 2002, were prepared and submitted to the laboratories for chemical analysis. No more soil samples will be collected as part of this monitoring program. The annual data report for 1999 was printed and distributed. The annual data report for 2000

was submitted for final USGS approval in May 2003. Another review of the draft annual report for 2001 was completed.

### Plans for the Current Period (July-December 2003)

Data will be compiled and reviewed. Changes suggested by review comments will be incorporated into the various draft reports, and the annual data report for 2001 will be submitted for USGS approval. The draft annual report of 2002 data will be completed and presented at the September 30, 2003, stakeholder meeting. The annual report of 2003 data will be started. The final interpretive report for this monitoring program will be started.

## Crops

### Approach

Crops from each of the six 20-acre soil-monitoring fields will be chemically analyzed after harvest. Analyses will include arsenic, cadmium, copper, lead, mercury, molybdenum, nickel, selenium, and zinc.

*Continued on page 10*

***If you have changes to the mailing list, please contact the Elbert County Environmental Health Officer (see page 12) or Tracy Yager (see page 12). Elbert County maintains the mailing list for these reports and for all meeting notices.***

***If you have questions about the Expanded Monitoring Program, please contact Tracy Yager (see page 12). Commonly asked questions will be included in each Progress Report.***

## USGS ground-water data, January-June 2003

[Data are preliminary and subject to revision. Standards from Colorado Department of Public Health and Environment, 1997, Basic standards for ground water, 5CCR 1002-41: July 14, 1997, 56 p. All data from filtered samples; mg/L, milligrams per liter; µg/L, micrograms per liter; <, less than; M, presence verified but not quantified; E, value estimated by laboratory]

Well (page 2)	Sample date	Time	Nitrate plus nitrite as nitrogen, mg/L	Arsenic, µg/L	Cadmium, µg/L	Chromium, µg/L	Copper, µg/L	Lead, µg/L	Mercury, µg/L	Molybdenum, µg/L	Nickel, µg/L	Selenium, µg/L	Zinc, µg/L
DTX3	01/06/03	1100	4.67	<2	<0.04	<0.8	4.2	<0.08	<0.02	0.8	14.9	11	2
DTX3	04/03/03	1010	4.11	<2	<0.04	<0.8	5.3	<0.08	<0.02	0.6	2.73	11	2
D17	01/02/03	1515	0.94	<2	<0.04	<0.8	0.8	<0.08	<0.02	5.5	2.76	8	M
D17	04/02/03	1240	0.94	<2	E0.02	<0.8	0.5	<0.08	<0.02	5.7	0.92	7	<1
DTX5	01/07/03	1530	<0.05	<2	<0.07	<0.8	6	<0.16	<0.02	1.2	22.2	<3	5
DTX5	04/03/03	1210	<0.05	<2	E0.05	<0.8	9.2	<0.16	<0.02	1	6.3	<3	4
DTX6	01/07/03	1342	0.2	<2	<0.07	<0.8	9.8	E0.12	<0.02	0.9	14.1	<3	5
DTX6	04/03/03	1440	0.17	<2	<0.07	<0.8	11.5	<0.16	<0.02	0.7	5.28	E1	5
D13	01/02/03	1300	<0.05	<2	<0.04	<0.8	2.2	<0.08	<0.02	1.1	7.55	<3	2
D13	04/02/03	1415	<0.05	<2	<0.04	<0.8	2.9	<0.08	<0.02	1	2.31	<3	1
D29	01/02/03	1035	<0.05	<2	<0.07	<0.8	7.3	<0.16	<0.02	0.8	25.6	<3	7
D29	04/02/03	1050	<0.05	<2	<0.07	<0.8	9.6	<0.16	<0.02	E0.4	6.74	<3	6
D6	01/03/03	1015	18.5	5	<0.26	<1.6	33.4	<0.56	<0.02	3.6	28.7	17	29
D6	04/04/03	1415	19.4	<4	<0.26	<1.6	39.5	<0.56	<0.02	3.1	16.9	8	22
D30	01/03/03	1240	<0.05	M	E0.08	<0.8	8	<0.24	<0.02	2.1	19.7	<3	7
D30	04/07/03	1135	<0.05	<2	E0.07	<0.8	12.3	<0.16	<0.02	2.1	7.69	<3	6
D25	01/03/03	1435	0.79	E2	0.22	<0.8	7.1	<0.16	<0.02	8.4	29.4	<3	6
D25	04/08/03	1035	0.78	E1	0.17	<0.8	11.5	<0.16	<0.02	7.6	10.5	<3	5
DTX10A	01/07/03	1105	<0.05	<2	<0.07	<0.8	5.7	<0.16	<0.02	1.4	31.1	<3	4
DTX10A	04/07/03	1400	<0.05	<2	<0.07	<0.8	7.3	<0.16	<0.02	1.2	4.62	<3	4
DTX8A	01/05/03	1105	<0.05	<2	<0.04	<0.8	2	<0.08	<0.02	0.6	4.93	<3	2
DTX8A	04/04/03	1200	0.11	<2	<0.04	<0.8	3.6	0.09	<0.02	0.6	1.87	<3	2
DTX2	01/05/03	1310	<0.05	<2	E0.05	<0.8	5.9	<0.16	<0.02	1.6	19.8	<3	5
DTX2	04/08/03	1200	<0.05	<2	E0.06	<0.8	9	<0.16	<0.02	1.6	8.59	<3	5
DTX1	01/05/03	1445	1.58	E2	0.13	<0.8	6	<0.16	<0.02	6.5	24	<3	5
DTX1	04/08/03	1320	1.6	E1	0.14	<0.8	7	<0.16	<0.02	6.2	13.8	<3	4
Human Health Standard			10	10	5	100	1,000	50	2	None	100	50	5,000
Agricultural Standard			100	100	10	100	200	100	10	None	200	20	2,000

## USGS ground-water data for plutonium, 2003

[Standards from Colorado Department of Public Health and Environment, 1997, Basic standards for ground water, 5CCR 1002-41: July 14, 1997, 56 p. Data are preliminary and subject to revision. All data from unfiltered samples; pCi/L, picocuries per liter; analytical uncertainty (defined on page 12) reported is the two-sigma combined analytical uncertainty]

Well	Sample Date	Plutonium 238, pCi/L	Plutonium 238, analytical uncertainty, pCi/L	Plutonium 238, minimum detectable concentration, pCi/L	Plutonium 239+240, pCi/L	Plutonium 239+240, analytical uncertainty, pCi/L	Plutonium 239+240, minimum detectable concentration, pCi/L
DTX3	01/06/03	-0.0020	0.0040	0.0146	0.0020	0.0040	0.0054
D17	01/02/03	0	0.0039	0.0043	0.0032	0.0063	0.0116
DTX5	01/07/03	0	0.0086	0.0095	0	0.0086	0.0095
DTX6	01/07/03	0	0.013	0.014	0.016	0.023	0.038
D13	01/02/03	0	0.0055	0.0061	0	0.0055	0.0061
D29	01/02/03	0	0.011	0.012	0.0044	0.0088	0.0119
D6	01/03/03	0	0.015	0.017	0	0.015	0.017
D30	01/03/03	0	0.014	0.036	-0.010	0.014	0.045
D25	01/03/03	0.0033	0.0067	0.0090	0	0.0082	0.0090
DTX10A	01/07/03	0.0067	0.0095	0.0090	0	0.0081	0.0090
DTX8A	01/05/03	0	0.0041	0.0046	0	0.0067	0.0156
DTX2	01/05/03	0	0.013	0.014	0	0.021	0.048
DTX1	01/05/03	0	0.0081	0.0090	0.0033	0.0066	0.0090
Human Health Standard		none found			0.15		
Agricultural Standard		none found			none found		

## USGS streambed-sediment data, January-June 2003

[Data are preliminary and subject to revision. Radioactivity data for these samples will be included in the next Progress Report. mg/kg, milligrams per kilogram; g/kg, grams per kilogram; µg/g, micrograms per gram; J, method blank contamination with the target analyte above detection but below reportable level; B, value is below reporting limit and estimated; <, less than]

Site (page 2)	Sample date	Total nitrogen, mg/kg	Phosphorous, mg/kg	Carbon, inorganic, g/kg	Carbon, total, g/kg	Carbon, organic, g/kg	Aluminum, µg/g	Arsenic, µg/g	Cadmium, µg/g
Biosolids applied	06/01/03	990	J 14	5.6	15	9.1	36,000	13	B 0.4
No biosolids	06/01/03	600	J,B 2.9	5.0	12	7.0	26,000	8.9	B 0.3

Site (page 2)	Sample date	Chromium, µg/g	Copper, µg/g	Lead, µg/g	Mercury, µg/g	Molybdenum, µg/g	Nickel, µg/g	Selenium, µg/g	Zinc, µg/g
Biosolids applied	06/01/03	J 42	22	29	B 0.03	B 0.6	27	B 1.8	120
No biosolids	06/01/03	J 31	16	18	<0.09	B 0.4	20	B 1.3	79



***The continuous-recorder instruments and wells DTX9, DTX10, and DTX11 are enclosed by chain-link fencing to keep people and animals away from the instruments. In addition, this site also is protected by a barbed-wire fence because cattle often are in the same field.***

## **Crops**

*Continued from page 7*

### **Progress Last Period (January-June 2003)**

Wheat samples collected from both the Arapahoe and Elbert County sites during July 2002 were dried, ground, and submitted to the laboratories for chemical analysis. No more crop samples will be collected as part of this monitoring program. The annual data report for 1999 was printed and distributed. The annual data report for 2000 was submitted for final USGS approval

in May 2003. Another review of the draft annual report for 2001 was completed.

### **Plans for the Current Period (July-December 2003)**

Data will be compiled and reviewed. Changes suggested by review comments will be incorporated into the various draft reports, and the annual data report for 2001 will be submitted for USGS approval. The draft annual re-

port of 2002 data will be completed and presented at the September 30, 2003, stakeholder meeting. The annual report of 2003 data will be started. The final interpretive report for this monitoring program will be started.

## Questions & Answers

*Continued from page 3*

Q: When does data collection end for the USGS Expanded Monitoring Program near Deer Trail?

A: For reporting purposes, the last data collection for the Expanded Monitoring Program near Deer Trail is September 2003. No data collected after September 2003 will be included in the USGS annual report for 2003 data or in the final interpretive report for the USGS Expanded Monitoring Program near Deer Trail. It will take about a year to prepare these reports and have the reports reviewed. The USGS will present these two reports to the stakeholders at a meeting in late 2004.

Q: Will the USGS continue sampling and other data collection after September 2003 at the Metro District properties near Deer Trail?

A: The USGS has been working with the Metro District to develop a feasible plan for USGS monitoring near Deer Trail for the period after September 2003 until the last two USGS reports and conclusions are presented to the stakeholders at a meeting in late 2004. This monitoring is referred to as the Interim Monitoring. During the time of Interim Monitoring, the highest priority of the USGS is to complete the last two reports. Therefore, Interim Monitoring likely will consist of a scaled-back monitoring approach: a combination of fewer sites monitored and fewer samples collected. A discussion about Interim Monitoring is planned for the stakeholder meeting on September 30, 2003.



***Ground water in well DTX8A is sampled with a submersible pump because the sampling depth is too deep to use a peristaltic pump. Only three wells in this monitoring program are sampled with a submersible pump: DTX8A, DTX10A, and D29. The USGS prefers to sample wells for this monitoring program with a peristaltic pump whenever possible because the submersible pump is made of stainless steel and could contribute some trace elements to the samples.***

## Definitions

*Analytical uncertainty*—The possible range of the true value or error term contributed by bias and variability of the laboratory measurement technique. All laboratory data have associated uncertainty. Each sample value should be thought of as a range in concentration defined by the reported value plus or minus the analytical uncertainty. The true concentration usually is somewhere in this range, but is not a precisely known point. For most analyses, the analytical uncertainty is not calculated for each sample but is estimated from bias and variability data derived from analyses of quality-assurance samples like blanks and replicates. For radioactivity data, the analytical uncertainty is calculated individually for each sample for each analyte based on analytical and statistical variables.

*Biosolids*—Solid organic matter recovered from a sewage-treatment process that meets regulatory criteria for beneficial use, such as for fertilizer. Metro District applies Grade I, Class B biosolids at Deer Trail. Regulations require that land-applied biosolids must meet or exceed Grade II, Class B. Grade I exceeds Grade II.

*Less than (<)*—A designation for analytical results to indicate that a constituent was not present or was present at very low levels that the laboratory could not reliably determine. Note that the actual amount of this constituent in that sample is unknown and could be any amount between zero and the “less than” value.

*Picocurie (pCi)*—A unit of measurement of radioactivity. One curie is defined as the amount of a radionuclide in which the decay rate is 37 billion (37,000,000,000) disintegrations per second. One picocurie is one trillionth (1/1,000,000,000,000) of a curie.

*Runoff*—The rain that hits the ground and flows over the land surface into valleys instead of infiltrating into the soil. Runoff can wash particles of soil, rock, plants, and biosolids from the land surface into the streambeds of the valleys.

*Stakeholder*—Any person or group (including the Metro District) interested or concerned about the Expanded Monitoring Program.

## Contacts

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***Fifth annual stakeholder  
meeting:  
is planned for September 30, 2003,  
at the Metro property near Deer  
Trail, Colorado***

*Prepared by* Tracy Yager, Dave Smith, and  
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